

# Northwestern Agricultural Research Center Field Day

## Thursday, July 15, 2021

### 11:00 am Registration & Introductions

11:30 Scott Buxbaum – NWARC Farmer Advisory Chair  
 11:35 Dr. Jessica A. Torrior – MSU NWARC Superintendent  
 11:40 Dr. Sreekala Bajwa – MSU Vice President and Dean, College of Agriculture  
 11:50 Dr. Darrin Boss – MSU Research Center Department Head

### 12:00 pm Lunch

12:30 Dr. Mary Burrows – Director, Montana Agricultural Experiment Station, MSU  
 12:40 Andy Lybeck – General CHS Topic  
 12:50 Karen Sowers – Executive Director, Pacific Northwest Canola Association

### 1:00 pm Field Tours



- **Levels of Alfalfa Dormancy, P, K, & Moisture**

Dr. Jessica Torrior – MSU Northwestern Agricultural Research Center  
 Scott Buxbaum – Producer

- **Nitrogen Input of Various Warm Season Forages in Rainfed and Irrigated Environments**

Dr. Jessica Torrior – MSU Northwestern Agricultural Research Center  
 Dr. Hayes Goosey – State Forage Specialist, Montana State University  
 Toby Hook - Producer

- **Planting Winter Canola and Variety Options**

Dr. Clint Beiermann – MSU Northwestern Agricultural Research Center  
 Ken McAlpin – Producer

- **Forage Barley**

Dr. Jamie Sherman – MSU Plant Science and Plant Pathology  
 Markus Braaten – Yara International

- **Winter Wheat Variety Options**

Jim Berg – MSU Plant Science and Plant Pathology  
 Andy Lybeck – Cenex Mountain West Co-op

- **Spring Wheat Herbicide Program**

Dr. Clint Beiermann – MSU Northwestern Agricultural Research Center  
 Tryg Koch – Producer



- **Cool-season Grass Forages**

Dr. Jessica Torrior – MSU Northwestern Agricultural Research Center  
 Bridgett Lake-Cheff – Producer  
 Sponsor: Lake Seeds, Inc.

### 3:30 pm Refreshments

# Northwestern Agricultural Research Center



Thank you to our sponsors:



## Northwestern Agricultural Research Center Faculty & Staff



Left to right: (Top) Eeusha Nafi, Clint Beiermann, Ben Clucka, Jordan Penny, Dan Porter, Zak Clouse, Ray Volin, Dave Davis, Nathan Schaff  
(Bottom) Charlene Kazmier, Maria Bay, Jessica Torrior, Annabel Radtke, Jessica Pavelka, Landry May

## Advisory Committee

### Flathead County

Markus Braaten, Tryg Koch, Andy Lybeck, Pat McGlynn

### Lake County

Dan Barz, Scott Buxbaum, Bridgett Lake-Cheff, Ken McAlpin, Jack Stivers

### Sanders County

Juli Thurston

## Levels of Alfalfa Dormancy, P, K, & Moisture

Jessica A. Torrion – MSU Northwestern Agricultural Research Center

Our goal with this project is to document yield, quality, and persistence of dormant to less-dormant alfalfa when P and K fertilizers are applied at or below optimum levels. This study is duplicated under rainfed and irrigation environments and is on the 3<sup>rd</sup> year of establishment.

Table 1. Management information

|               |                                                    |               |                  |
|---------------|----------------------------------------------------|---------------|------------------|
| Planted:      | May 22, 2019                                       | Soil type     | Fine-sandy loam  |
| Seeding rate: | 30 live plants/ft <sup>2</sup> (8.5 – 13.7 lbs/Ac) | Tillage       | Conventional     |
| Emerged:      | May 29, 2019                                       | Previous crop | Barley           |
| Inoculant:    | Verdesian PreVail                                  | Herbicide:    | Raptor (6/18/19) |
| 2019 Soil P:  | 7 ppm                                              | 2019 Soil K:  | 117 ppm          |

Table 2. Fertilizer rates

| Treatment | 2019                                                            | 2021                                                            |                                                                 |
|-----------|-----------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|
|           |                                                                 | rainfed                                                         | Irrigated                                                       |
| OP/OK     | control                                                         | control                                                         | control                                                         |
| OP/1K     | 0 lb P <sub>2</sub> O <sub>5</sub> / 170 lbs K <sub>2</sub> O   | none                                                            | 0 lb P <sub>2</sub> O <sub>5</sub> / 170 lbs K <sub>2</sub> O   |
| OP/.5K    | 0 lb P <sub>2</sub> O <sub>5</sub> / 85 lbs K <sub>2</sub> O    | none                                                            | none                                                            |
| 1P/1K     | 40 lbs P <sub>2</sub> O <sub>5</sub> / 170 lbs K <sub>2</sub> O | 0 lb P <sub>2</sub> O <sub>5</sub> / 170 lbs K <sub>2</sub> O   | 0 lb P <sub>2</sub> O <sub>5</sub> / 170 lbs K <sub>2</sub> O   |
| 1P/.5K    | 40 lbs P <sub>2</sub> O <sub>5</sub> / 85 lbs K <sub>2</sub> O  | 100 lbs P <sub>2</sub> O <sub>5</sub> / 85 lbs K <sub>2</sub> O | 100 lbs P <sub>2</sub> O <sub>5</sub> / 85 lbs K <sub>2</sub> O |

Table 3. Alfalfa varieties

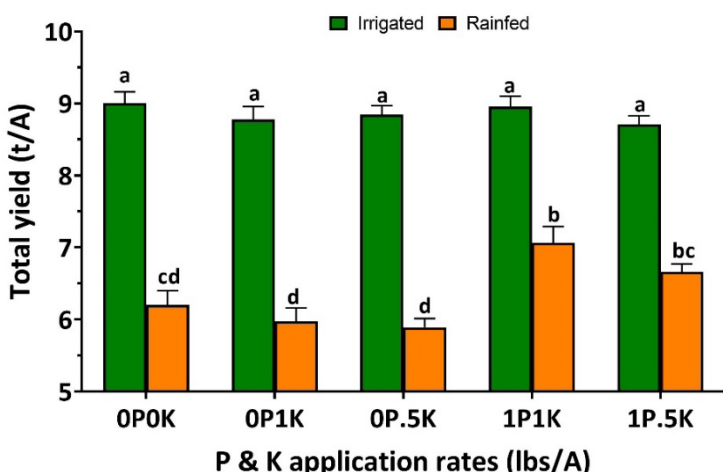
| Variety     | Brand     | Dormancy               | Winter hardiness |
|-------------|-----------|------------------------|------------------|
| Maxi-Graze  | Croplan   | 2 (very dormant)       | 2                |
| Rugged      | Alforex   | 3 (dormant)            | 1                |
| RR Alphonse | Croplan   | 4 (dormant)            | 1.5              |
| RR Saltiva  | Croplan   | 5 (moderately dormant) | 2.5              |
| Cisco II    | Alforex   | 6 (semi-dormant)       | 2                |
| Magna715    | Dairyland | 7 (semi-dormant)       | -                |

## Results

Year 1 (2019).

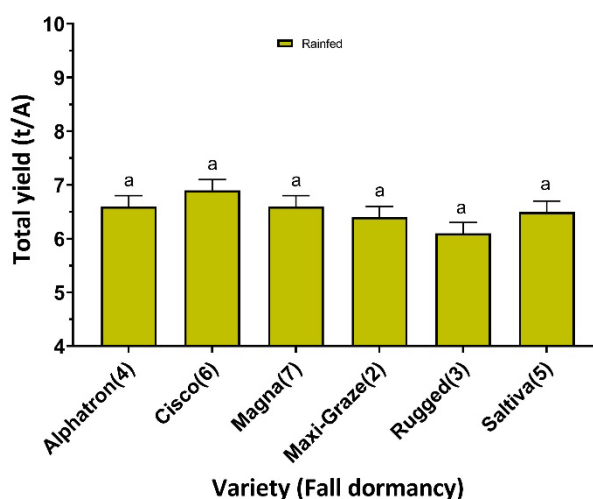
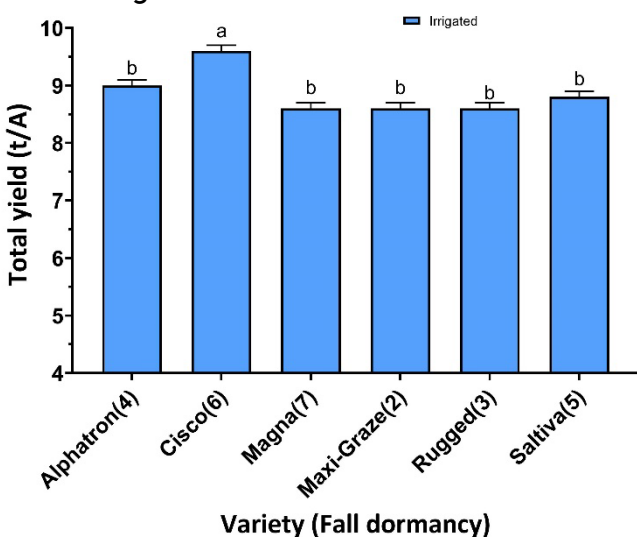
- No significant differences with fertilizer treatments
- Cisco II and Magna715 yielded better among the cultivars under irrigation

Year 2 (2020).



**Figure 1.** 2020 total yields (3 cuttings) with fertility levels at Creston, MT. Same letter assignment denotes no statistical difference ( $\alpha = 0.05$ ).

- Cisco II yielded the highest (significantly) under irrigation
- Cisco II tends to have numerically-higher yield in the rainfed, but remained insignificant



**Figure 2.** 2020 total yields (3 cuttings) with alfalfa varieties at Creston, MT. Same letter assignment denotes no statistical difference ( $\alpha = 0.05$ ).

Funded by: Montana Fertilizer Tax Advisory Committee

| Plot ID | FERT  | VAR       | REP | Plot ID | TRT   | VAR       | REP |
|---------|-------|-----------|-----|---------|-------|-----------|-----|
| 101     | OP1K  | Cisco     | 1   | 216     | OP0K  | Saltiva   | 2   |
| 102     | OP1K  | Saltiva   | 1   | 217     | OP0K  | Cisco     | 2   |
| 103     | OP1K  | Alphatron | 1   | 218     | OP0K  | Rugged    | 2   |
| 104     | OP1K  | Rugged    | 1   | 219     | OP.5K | Magna     | 2   |
| 105     | OP1K  | Maxigraze | 1   | 220     | OP.5K | Maxigraze | 2   |
| 106     | OP1K  | Magna     | 1   | 221     | OP.5K | Cisco     | 2   |
| 107     | OP0K  | Magna     | 1   | 222     | OP.5K | Saltiva   | 2   |
| 108     | OP0K  | Saltiva   | 1   | 223     | OP.5K | Alphatron | 2   |
| 109     | OP0K  | Rugged    | 1   | 224     | OP.5K | Rugged    | 2   |
| 110     | OP0K  | Alphatron | 1   | 225     | 1P.5K | Maxigraze | 2   |
| 111     | OP0K  | Cisco     | 1   | 226     | 1P.5K | Cisco     | 2   |
| 112     | OP0K  | Maxigraze | 1   | 227     | 1P.5K | Alphatron | 2   |
| 113     | 1P.5K | Maxigraze | 1   | 228     | 1P.5K | Rugged    | 2   |
| 114     | 1P.5K | Rugged    | 1   | 229     | 1P.5K | Saltiva   | 2   |
| 115     | 1P.5K | Saltiva   | 1   | 230     | 1P.5K | Magna     | 2   |
| 116     | 1P.5K | Magna     | 1   | 301     | OP0K  | Cisco     | 3   |
| 117     | 1P.5K | Alphatron | 1   | 302     | OP0K  | Rugged    | 3   |
| 118     | 1P.5K | Cisco     | 1   | 303     | OP0K  | Maxigraze | 3   |
| 119     | OP.5K | Rugged    | 1   | 304     | OP0K  | Alphatron | 3   |
| 120     | OP.5K | Magna     | 1   | 305     | OP0K  | Saltiva   | 3   |
| 121     | OP.5K | Cisco     | 1   | 306     | OP0K  | Magna     | 3   |
| 122     | OP.5K | Alphatron | 1   | 307     | 1P1K  | Alphatron | 3   |
| 123     | OP.5K | Saltiva   | 1   | 308     | 1P1K  | Rugged    | 3   |
| 124     | OP.5K | Maxigraze | 1   | 309     | 1P1K  | Cisco     | 3   |
| 125     | 1P1K  | Rugged    | 1   | 310     | 1P1K  | Maxigraze | 3   |
| 126     | 1P1K  | Cisco     | 1   | 311     | 1P1K  | Saltiva   | 3   |
| 127     | 1P1K  | Maxigraze | 1   | 312     | 1P1K  | Magna     | 3   |
| 128     | 1P1K  | Alphatron | 1   | 313     | 1P.5K | Alphatron | 3   |
| 129     | 1P1K  | Magna     | 1   | 314     | 1P.5K | Rugged    | 3   |
| 130     | 1P1K  | Saltiva   | 1   | 315     | 1P.5K | Maxigraze | 3   |
| 201     | OP1K  | Saltiva   | 2   | 316     | 1P.5K | Magna     | 3   |
| 202     | OP1K  | Alphatron | 2   | 317     | 1P.5K | Saltiva   | 3   |
| 203     | OP1K  | Maxigraze | 2   | 318     | 1P.5K | Cisco     | 3   |
| 204     | OP1K  | Magna     | 2   | 319     | OP1K  | Cisco     | 3   |
| 205     | OP1K  | Cisco     | 2   | 320     | OP1K  | Magna     | 3   |
| 206     | OP1K  | Rugged    | 2   | 321     | OP1K  | Saltiva   | 3   |
| 207     | 1P1K  | Alphatron | 2   | 322     | OP1K  | Alphatron | 3   |
| 208     | 1P1K  | Rugged    | 2   | 323     | OP1K  | Rugged    | 3   |
| 209     | 1P1K  | Cisco     | 2   | 324     | OP1K  | Maxigraze | 3   |
| 210     | 1P1K  | Magna     | 2   | 325     | OP.5K | Saltiva   | 3   |
| 211     | 1P1K  | Saltiva   | 2   | 326     | OP.5K | Alphatron | 3   |
| 212     | 1P1K  | Maxigraze | 2   | 327     | OP.5K | Magna     | 3   |
| 213     | OP0K  | Alphatron | 2   | 328     | OP.5K | Maxigraze | 3   |
| 214     | OP0K  | Maxigraze | 2   | 329     | OP.5K | Rugged    | 3   |
| 215     | OP0K  | Magna     | 2   | 330     | OP.5K | Cisco     | 3   |

## Nitrogen Input of Various Warm-Season Forages in Rainfed and Irrigated Environments

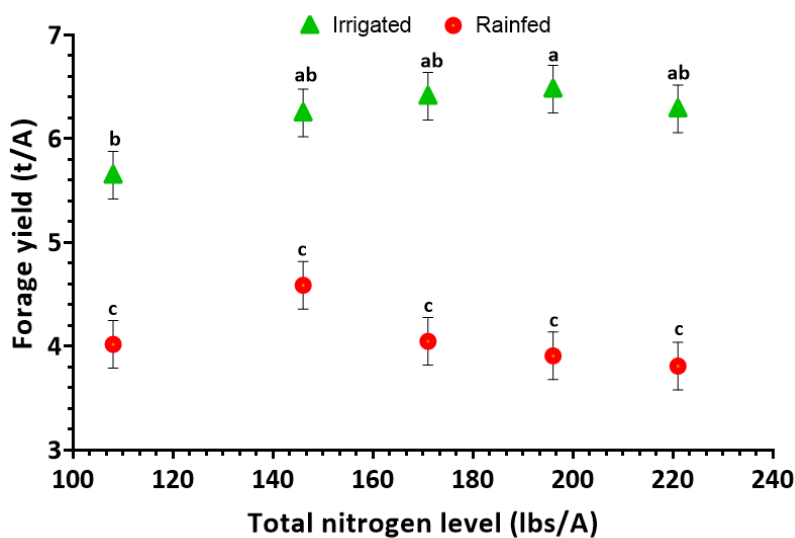
Jessica A. Torrion – MSU Northwestern Ag Research Center

Table 1. Management Information

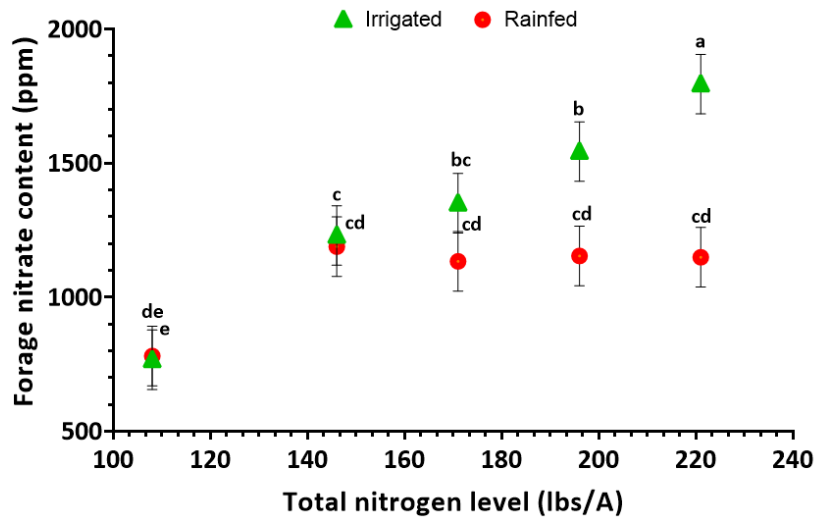
|                                                                                   |                |                                                                       |                                  |
|-----------------------------------------------------------------------------------|----------------|-----------------------------------------------------------------------|----------------------------------|
| Seeding date:                                                                     | 5/28-29/20     | Field Location:                                                       | R5                               |
| Seeding rate:                                                                     | See Table 2    | Harvest date:                                                         | Species-dependent<br>(7/28-9/29) |
| Previous crop:                                                                    | Alfalfa        | Soil type:                                                            | Creston Silt Loam                |
| Herbicide:                                                                        | Shredder       | Tillage:                                                              | Conventional                     |
| Fertilizer applied<br>(N, P <sub>2</sub> O <sub>5</sub> , K <sub>2</sub> O lb/A): | N rates -40-80 | Soil residual nutrient<br>(NO <sub>3</sub> <sup>-</sup> , P, K lb/A): | 78-26-37                         |

Table 2. Management Information

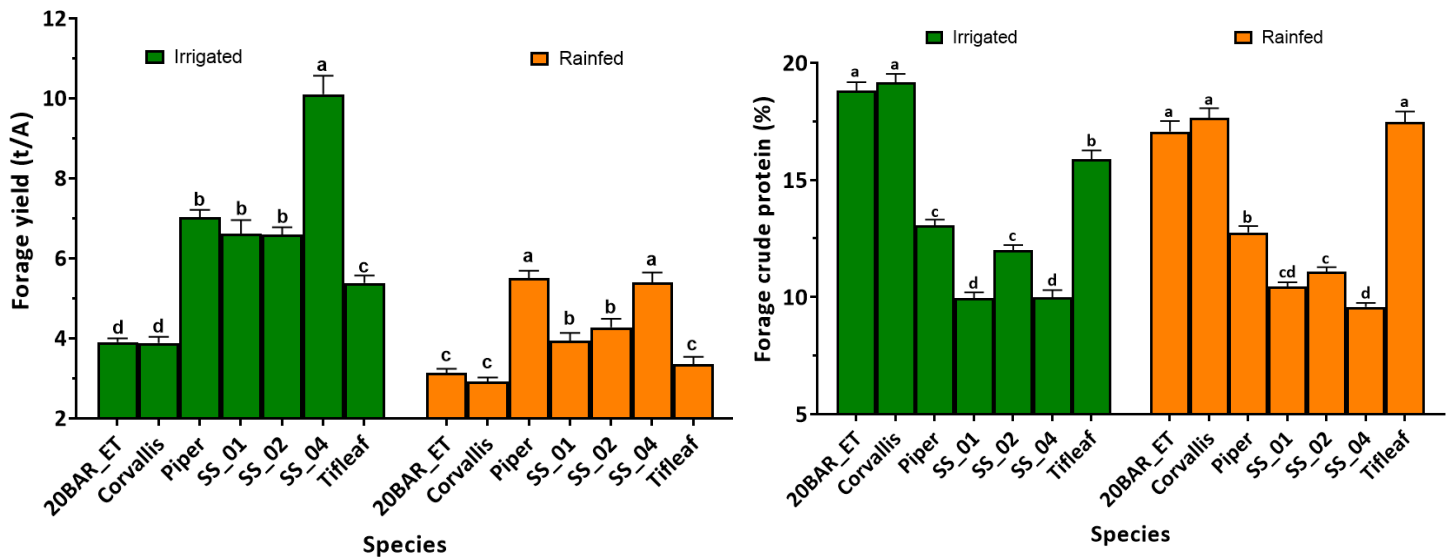
| Entry     | Species       | Seeding rate (Seeds/ft <sup>2</sup> ) |
|-----------|---------------|---------------------------------------|
| Tifleaf 3 | Pearl Millet  | 15                                    |
| Piper     | Sudangrass    | 25                                    |
| Corvallis | Teff          | 10                                    |
| 20BAR_ET  | Teff          | 10                                    |
| SS_01     | Sorghum-Sudan | 25                                    |
| SS_02     | Sorghum-Sudan | 25                                    |
| SS_04     | Sorghum-Sudan | 25                                    |



**Figure 1.** Water regime x N interaction of forage yield. The total nitrogen (N) was the total N supply from the initial soil residual nitrates down to 2-ft depth + N from applied from urea, monoammonium phosphates + N credit from previous alfalfa crop.



**Figure 2.** Water regime x N interaction of forage nitrate (ppm). The total nitrogen (N) was the total N supply from the initial soil residual nitrates down to 2-ft depth + N from applied from urea, monoammonium phosphates + N credit from previous alfalfa crop.



**Figure 3.** Water regime x species interaction of forage yield (left) and crude protein (right).

- Optimal yield for warm-season forages can be achieved with a total N units close to 100 lbs/Ac (consider residual N down to 2-ft, previous crop N credits, and applied N)
- Increasing N and irrigation increase forage nitrate content.
- High yielding warm-season grasses have lower forage crude protein, and vice versa
- Cut sorghum-sudan before frost.



| WARMS IRRIGATED (Warm Season Forages N Study) |     |     |     |           |     |     |     |      |     |     |     |           |     |     |     |     |     |      |     |     |     |           |     |     |     |     |     |   |
|-----------------------------------------------|-----|-----|-----|-----------|-----|-----|-----|------|-----|-----|-----|-----------|-----|-----|-----|-----|-----|------|-----|-----|-----|-----------|-----|-----|-----|-----|-----|---|
| B                                             | 129 | 130 | 131 | 132       | 133 | 134 | 135 | B    | ww  | B   | 229 | 230       | 231 | 232 | 233 | 234 | 235 | B    | ww  | B   | 329 | 330       | 331 | 332 | 333 | 334 | 335 | B |
| B                                             | 122 | 123 | 124 | 125       | 126 | 127 | 128 | B    | ww  | B   | 222 | 223       | 224 | 225 | 226 | 227 | 228 | B    | ww  | B   | 322 | 323       | 324 | 325 | 326 | 327 | 328 | B |
| B                                             | 115 | 116 | 117 | 118       | 119 | 120 | 121 | B    | ww  | B   | 215 | 216       | 217 | 218 | 219 | 220 | 221 | B    | ww  | B   | 315 | 316       | 317 | 318 | 319 | 320 | 321 | B |
| B                                             | 108 | 109 | 110 | 111       | 112 | 113 | 114 | B    | ww  | B   | 208 | 209       | 210 | 211 | 212 | 213 | 214 | B    | ww  | B   | 308 | 309       | 310 | 311 | 312 | 313 | 314 | B |
| B                                             | 101 | 102 | 103 | 104       | 105 | 106 | 107 | B    | ww  | B   | 201 | 202       | 203 | 204 | 205 | 206 | 207 | B    | ww  | B   | 301 | 302       | 303 | 304 | 305 | 306 | 307 | B |
| 1                                             | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1    | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1   | 1    | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1   |   |
| Plot                                          | TRT | N   | rep | entry     |     |     |     | Plot | TRT | N   | rep | entry     |     |     |     |     |     | Plot | TRT | N   | rep | entry     |     |     |     |     |     |   |
| 101                                           | 1   | 0   | 1   | Tifleaf 3 |     |     |     | 201  | 12  | 120 | 2   | S5501     |     |     |     |     |     | 301  | 2   | 0   | 3   | Piper     |     |     |     |     |     |   |
| 102                                           | 2   | 0   | 1   | Piper     |     |     |     | 202  | 9   | 120 | 2   | Piper     |     |     |     |     |     | 302  | 6   | 0   | 3   | AS6402    |     |     |     |     |     |   |
| 103                                           | 3   | 0   | 1   | Corvallis |     |     |     | 203  | 10  | 120 | 2   | Corvallis |     |     |     |     |     | 303  | 1   | 0   | 3   | Tifleaf 3 |     |     |     |     |     |   |
| 104                                           | 4   | 0   | 1   | 20BAR_ET  |     |     |     | 204  | 8   | 120 | 2   | Tifleaf 3 |     |     |     |     |     | 304  | 5   | 0   | 3   | S5501     |     |     |     |     |     |   |
| 105                                           | 5   | 0   | 1   | S5501     |     |     |     | 205  | 14  | 120 | 2   | S6504     |     |     |     |     |     | 305  | 3   | 0   | 3   | Corvallis |     |     |     |     |     |   |
| 106                                           | 6   | 0   | 1   | AS6402    |     |     |     | 206  | 11  | 120 | 2   | 20BAR_ET  |     |     |     |     |     | 306  | 7   | 0   | 3   | S6504     |     |     |     |     |     |   |
| 107                                           | 7   | 0   | 1   | S6504     |     |     |     | 207  | 13  | 120 | 2   | AS6402    |     |     |     |     |     | 307  | 4   | 0   | 3   | 20BAR_ET  |     |     |     |     |     |   |
| 108                                           | 8   | 120 | 1   | Tifleaf 3 |     |     |     | 208  | 16  | 140 | 2   | Piper     |     |     |     |     |     | 308  | 9   | 120 | 3   | Piper     |     |     |     |     |     |   |
| 109                                           | 9   | 120 | 1   | Piper     |     |     |     | 209  | 15  | 140 | 2   | Tifleaf 3 |     |     |     |     |     | 309  | 14  | 120 | 3   | S6504     |     |     |     |     |     |   |
| 110                                           | 10  | 120 | 1   | Corvallis |     |     |     | 210  | 20  | 140 | 2   | AS6402    |     |     |     |     |     | 310  | 13  | 120 | 3   | AS6402    |     |     |     |     |     |   |
| 111                                           | 11  | 120 | 1   | 20BAR_ET  |     |     |     | 211  | 17  | 140 | 2   | Corvallis |     |     |     |     |     | 311  | 11  | 120 | 3   | 20BAR_ET  |     |     |     |     |     |   |
| 112                                           | 12  | 120 | 1   | S5501     |     |     |     | 212  | 19  | 140 | 2   | S5501     |     |     |     |     |     | 312  | 12  | 120 | 3   | S5501     |     |     |     |     |     |   |
| 113                                           | 13  | 120 | 1   | AS6402    |     |     |     | 213  | 18  | 140 | 2   | 20BAR_ET  |     |     |     |     |     | 313  | 10  | 120 | 3   | Corvallis |     |     |     |     |     |   |
| 114                                           | 14  | 120 | 1   | S6504     |     |     |     | 214  | 21  | 140 | 2   | S6504     |     |     |     |     |     | 314  | 8   | 120 | 3   | Tifleaf 3 |     |     |     |     |     |   |
| 115                                           | 15  | 140 | 1   | Tifleaf 3 |     |     |     | 215  | 30  | 220 | 2   | Piper     |     |     |     |     |     | 315  | 30  | 220 | 3   | Piper     |     |     |     |     |     |   |
| 116                                           | 16  | 140 | 1   | Piper     |     |     |     | 216  | 33  | 220 | 2   | S5501     |     |     |     |     |     | 316  | 32  | 220 | 3   | 20BAR_ET  |     |     |     |     |     |   |
| 117                                           | 17  | 140 | 1   | Corvallis |     |     |     | 217  | 32  | 220 | 2   | 20BAR_ET  |     |     |     |     |     | 317  | 35  | 220 | 3   | S6504     |     |     |     |     |     |   |
| 118                                           | 18  | 140 | 1   | 20BAR_ET  |     |     |     | 218  | 34  | 220 | 2   | AS6402    |     |     |     |     |     | 318  | 31  | 220 | 3   | Corvallis |     |     |     |     |     |   |
| 119                                           | 19  | 140 | 1   | S5501     |     |     |     | 219  | 31  | 220 | 2   | Corvallis |     |     |     |     |     | 319  | 33  | 220 | 3   | S5501     |     |     |     |     |     |   |
| 120                                           | 20  | 140 | 1   | AS6402    |     |     |     | 220  | 29  | 220 | 2   | Tifleaf 3 |     |     |     |     |     | 320  | 29  | 220 | 3   | Tifleaf 3 |     |     |     |     |     |   |
| 121                                           | 21  | 140 | 1   | S6504     |     |     |     | 221  | 35  | 150 | 2   | S6504     |     |     |     |     |     | 321  | 34  | 220 | 3   | AS6402    |     |     |     |     |     |   |
| 122                                           | 22  | 180 | 1   | Tifleaf 3 |     |     |     | 222  | 2   | 0   | 2   | Piper     |     |     |     |     |     | 322  | 24  | 180 | 3   | Corvallis |     |     |     |     |     |   |
| 123                                           | 23  | 180 | 1   | Piper     |     |     |     | 223  | 6   | 0   | 2   | AS6402    |     |     |     |     |     | 323  | 27  | 180 | 3   | AS6402    |     |     |     |     |     |   |
| 124                                           | 24  | 180 | 1   | Corvallis |     |     |     | 224  | 5   | 0   | 2   | S5501     |     |     |     |     |     | 324  | 26  | 180 | 3   | S5501     |     |     |     |     |     |   |
| 125                                           | 25  | 180 | 1   | 20BAR_ET  |     |     |     | 225  | 3   | 0   | 2   | Corvallis |     |     |     |     |     | 325  | 28  | 180 | 3   | S6504     |     |     |     |     |     |   |
| 126                                           | 26  | 180 | 1   | S5501     |     |     |     | 226  | 1   | 0   | 2   | Tifleaf 3 |     |     |     |     |     | 326  | 22  | 180 | 3   | Tifleaf 3 |     |     |     |     |     |   |
| 127                                           | 27  | 180 | 1   | AS6402    |     |     |     | 227  | 7   | 0   | 2   | S6504     |     |     |     |     |     | 327  | 23  | 180 | 3   | Piper     |     |     |     |     |     |   |
| 128                                           | 28  | 180 | 1   | S6504     |     |     |     | 228  | 4   | 0   | 2   | 20BAR_ET  |     |     |     |     |     | 328  | 25  | 180 | 3   | 20BAR_ET  |     |     |     |     |     |   |
| 129                                           | 29  | 220 | 1   | Tifleaf 3 |     |     |     | 229  | 23  | 180 | 2   | Piper     |     |     |     |     |     | 329  | 21  | 120 | 3   | S6504     |     |     |     |     |     |   |
| 130                                           | 30  | 220 | 1   | Piper     |     |     |     | 230  | 22  | 180 | 2   | Tifleaf 3 |     |     |     |     |     | 330  | 18  | 120 | 3   | 20BAR_ET  |     |     |     |     |     |   |
| 131                                           | 31  | 220 | 1   | Corvallis |     |     |     | 231  | 25  | 180 | 2   | 20BAR_ET  |     |     |     |     |     | 331  | 17  | 120 | 3   | Corvallis |     |     |     |     |     |   |
| 132                                           | 32  | 220 | 1   | 20BAR_ET  |     |     |     | 232  | 26  | 180 | 2   | S5501     |     |     |     |     |     | 332  | 16  | 120 | 3   | Piper     |     |     |     |     |     |   |
| 133                                           | 33  | 220 | 1   | S5501     |     |     |     | 233  | 28  | 180 | 2   | S6504     |     |     |     |     |     | 333  | 20  | 120 | 3   | AS6402    |     |     |     |     |     |   |
| 134                                           | 34  | 220 | 1   | AS6402    |     |     |     | 234  | 27  | 180 | 2   | AS6402    |     |     |     |     |     | 334  | 19  | 120 | 3   | S5501     |     |     |     |     |     |   |
| 135                                           | 35  | 220 | 1   | S6504     |     |     |     | 235  | 24  | 180 | 2   | Corvallis |     |     |     |     |     | 335  | 15  | 120 | 3   | Tifleaf 3 |     |     |     |     |     |   |

NW  
  
 Planting Direction

Total N lbs/Ac  
 0 just residual  
 120  
 140  
 180  
 220



## 2021 Winter Canola Planting Date

Introduction: Adoption of winter canola has been limited in Montana and other northern regions of the great plains compared to spring canola. A perceived disadvantage of winter canola is poor winter survival. The objective of this project is to determine if planting timing and variety affects winter survival, yield, and other agronomic characteristics of winter canola.

| Table 1. Management information |                          |                                             |                 |
|---------------------------------|--------------------------|---------------------------------------------|-----------------|
| Seeding date:                   | 8/15/20, 9/1/20, 9/15/20 | Field:                                      | R3              |
| Julian date:                    | 227, 244, 258            | Soil type:                                  | Fine Sandy Loam |
| Seeding rate:                   | 810,000 plants/A         | Tillage:                                    | Conventional    |
| Previous crop:                  | Spring Wheat             | Soil residual nutrient (N, P, K lb/A):      | 48-12-186       |
| Herbicide:                      | 8/28/2020 - Clethodim    | Nutrient fertilizer applied (N, P, K lb/A): | 100-40-35-10S   |

| Table 2. Planting Date |
|------------------------|
| August 15              |
| September 1            |
| September 15           |

| Table 3. Varieties  |
|---------------------|
| Croplan 1022WC      |
| Croplan 225RR       |
| Croplan 320RR       |
| Rubisco Mercedes    |
| Rubisco PluraxCL    |
| Photosyntech Quartz |

| Table 4. Preliminary Data |                        |                          |                   |
|---------------------------|------------------------|--------------------------|-------------------|
| Treatment                 | Fall Stand Plants/Acre | Spring Stand Plants/Acre | % Stand Reduction |
| August 15                 | 626,470 B*             | 471,093 AB               | 23.21 A           |
| September 1               | 651,787 B              | 518,749 A                | 17.92 A           |
| September 15              | 745,608 A              | 427,409 B                | 41.59 B           |

\*Treatments denoted by different letters are significantly different at  $\alpha=0.05$

Early data: Canola planted between August 15<sup>th</sup> and September 1<sup>st</sup> resulted in nearly 20% stand reduction over the winter season. Canola planted on September 15<sup>th</sup> resulted in significantly greater stand reduction at 42%. There was no effect of winter canola variety on stand or stand reduction over the winter.

## Forage Barley

Dr. Jamie Sherman – MSU Plant Science and Plant Pathology

### 2021 Barley Forage Intrastate AYT

| Entry            | Cultivar/Line | Origin/Pedigree | Plot Numbers |       |       |
|------------------|---------------|-----------------|--------------|-------|-------|
|                  |               |                 | Rep 1        | Rep 2 | Rep 3 |
| ¥ = new for 2020 |               |                 |              |       |       |
| 1                | Hays          |                 | 118          | 204   | 310   |
| 2                | Lavina        |                 | 123          | 206   | 324   |
| 3                | Haymaker      |                 | 122          | 205   | 318   |
| 4                | MT16F02902    |                 | 115          | 209   | 303   |
| 5                | MT18F01104    |                 | 117          | 223   | 304   |
| 6                | MT18F00503    |                 | 102          | 207   | 307   |
| 7                | MT18F00507    |                 | 109          | 221   | 308   |
| 8                | MT18F00403    |                 | 124          | 212   | 305   |
| 9                | MT16F01601    |                 | 121          | 224   | 312   |
| 10               | MT18F00607    |                 | 114          | 203   | 322   |
| 11               | MT16F02410    |                 | 105          | 225   | 325   |
| 12               | MT17F01611    |                 | 103          | 213   | 313   |
| 13               | MT18F01010    |                 | 106          | 208   | 320   |
| 14               | MT16F02408    |                 | 110          | 202   | 314   |
| 15               | MT19_F05_03   |                 | 112          | 216   | 315   |
| 16               | MT19_F03_05   |                 | 104          | 219   | 319   |
| 17               | MT18F00803    |                 | 108          | 220   | 302   |
| 18               | MT19_F07_04   |                 | 113          | 222   | 316   |
| 19               | MT17F02406    |                 | 111          | 215   | 309   |
| 20               | MT19_F04_03   |                 | 119          | 210   | 311   |
| 21               | MT19_F04_02   |                 | 125          | 218   | 306   |
| 22               | MT19_F05_04   |                 | 107          | 214   | 321   |
| 23               | MT19_F06_04   |                 | 101          | 201   | 301   |
| 24               | MT19_F07_02   |                 | 120          | 211   | 317   |
| 25               | MT19_F06_02   |                 | 116          | 217   | 323   |

## 2021 Barley Forage EYT

| Entry | Cultivar/Line    | Origin/Pedigree | Plot Numbers |          |          |
|-------|------------------|-----------------|--------------|----------|----------|
|       |                  |                 | Rep<br>1     | Rep<br>2 | Rep<br>3 |
|       | ¥ = new for 2020 |                 |              |          |          |
| 1     | Hays             |                 | 127          | 236      | 323      |
| 2     | Lavina           |                 | 111          | 221      | 315      |
| 3     | Haymaker         |                 | 118          | 206      | 334      |
| 4     | MT16F01606       |                 | 110          | 235      | 305      |
| 5     | MT16F01607       |                 | 108          | 209      | 311      |
| 6     | MT16F02401       |                 | 103          | 229      | 316      |
| 7     | MT16F02405       |                 | 134          | 215      | 332      |
| 8     | MT17F01612       |                 | 105          | 201      | 322      |
| 9     | MT17F02407       |                 | 109          | 218      | 320      |
| 10    | MT17F02410       |                 | 123          | 216      | 312      |
| 11    | MT17F02901       |                 | 129          | 220      | 335      |
| 12    | MT16F02406       |                 | 130          | 217      | 328      |
| 13    | MT16F02903       |                 | 121          | 223      | 303      |
| 14    | MT17F01606       |                 | 120          | 202      | 318      |
| 15    | MT18F00203       |                 | 117          | 208      | 301      |
| 16    | MT18F00405       |                 | 126          | 207      | 317      |
| 17    | MT18F00602       |                 | 122          | 232      | 333      |
| 18    | MT18F00714       |                 | 116          | 214      | 313      |
| 19    | MT18F00812       |                 | 131          | 225      | 306      |
| 20    | MT18F00908       |                 | 104          | 213      | 304      |
| 21    | MT18F00911       |                 | 102          | 211      | 336      |
| 22    | MT18F00509       |                 | 128          | 205      | 302      |
| 23    | MT18F00508       |                 | 114          | 222      | 319      |
| 24    | MT19_F07_03      |                 | 107          | 204      | 327      |
| 25    | MT19_F02_01      |                 | 136          | 210      | 321      |
| 26    | MT19_F04_01      |                 | 132          | 203      | 309      |
| 27    | MT19_F03_06      |                 | 106          | 219      | 310      |
| 28    | MT19_F01_03      |                 | 124          | 228      | 324      |
| 29    | MT19_F04_05      |                 | 112          | 226      | 331      |
| 30    | MT19_F03_02      |                 | 101          | 234      | 329      |
| 31    | MT19_F02_03      |                 | 113          | 231      | 308      |
| 32    | MT19_F01_01      |                 | 135          | 224      | 325      |
| 33    | MT19_F03_01      |                 | 115          | 227      | 330      |
| 34    | MT19_F03_04      |                 | 133          | 233      | 314      |
| 35    | MT19_F07_05      |                 | 119          | 212      | 326      |
| 36    | MT19_F06_03      |                 | 125          | 230      | 307      |

# Winter Wheat Varieties for Northwestern Montana

Variety information for northwestern Montana for the past 2 years has been very limited. In 2018, the leading variety was Yellowstone (Montana, 2005) at 54% followed by Judee (Montana, 2011) at 46% – see table below.

| Leading Winter Wheat Varieties planted in Northwestern Montana, 2018-2020 |         |         |             |
|---------------------------------------------------------------------------|---------|---------|-------------|
|                                                                           | 2020    | 2019    | 2018        |
| 1                                                                         | no data | no data | Yellowstone |
| 2                                                                         |         |         | Judee       |
| 3                                                                         |         |         |             |

The Montana Winter Wheat Breeding Program devotes 50% of its' effort to developing new and improved sawfly varieties. We are working on wheat streak mosaic virus and fusarium head blight resistance, acid soil tolerance, and increased winter hardiness – while maintaining high end use quality. The MSU program also continues to work on early heading/maturing variety development for Montana.

We are still developing 2-gene Clearfield solid- and hollow-stemmed lines for use in grassy weed situations. We have a relatively new CoAxiom program that has started to develop lines as a compliment to Clearfield technology. We have crossed hollow and solid-stemmed varieties to both Colorado and Limagrain CoAxiom varieties using the doubled haploid method, which are now in replicated testing, and could potentially become varieties in 4-5 year. There is a small 25 entry CoAxiom test at both Creston and Bozeman for 2021.

Winter wheat varieties and experimental lines have been tested at Northwestern Ag Research Center for many years. The next table shows 2020, 2 year (2019-2020), and 3 year (2018-2020 grain yields from field plots at Creston. Additional agronomic data (test weight, heading date, plant height, and grain protein) are provided from the 2020 test.

Leading varieties, over 3 years (2018-2020), include LCS Jet (Limagrain, 2015), Keldin (Westbred, 2011), and Flathead (Montana, 2019). Other varieties that perform above average include SY Clearstone (Montana/Syngenta, 2012), Northern (Montana, 2015), Loma (Montana, 2016), Yellowstone, and AAC Wildfire (Alberta, 2015).

| Table 3. HARD WINTER : District 1-- Kalispell - Dryland (High Rainfall) |                            |              |              |  |             |              |               |             |             |
|-------------------------------------------------------------------------|----------------------------|--------------|--------------|--|-------------|--------------|---------------|-------------|-------------|
| Spring flooding, weeds - plots not harvested in 2017                    |                            |              |              |  |             |              |               |             |             |
| Cultivar/Line                                                           |                            |              |              |  | 2020 Data   |              |               |             |             |
|                                                                         | Grain Yield (bushels/acre) |              |              |  | Test        | Heading Date |               | Plant       | Protein     |
|                                                                         | 2020                       | 2019-20      | 2018-20      |  | weight      | Ordinal      | Calendar      | height      |             |
|                                                                         | 1y                         | 2y           | 3y           |  | lb/bu       | from Jan1    |               | in          | %           |
| AAC Wildfire ++                                                         | 156.9                      | 145.7        | 124.8        |  | 59.1        | 169.7        | 18-Jun        | 42.4        | 10.2        |
| Bobcat ++                                                               | 139.5                      | 128.6        | 117.1        |  | <b>63.8</b> | 167.0        | 15-Jun        | 36.4        | 10.2        |
| Brawl CL Plus +                                                         | 135.6                      | 122.8        | 110.8        |  | 63.5        | 161.0        | 9-Jun         | 34.5        | <b>11.4</b> |
| Byrd CL Plus ++                                                         | <b>158.7</b>               | 142.5        | 118.3        |  | 62.2        | 163.3        | 11-Jun        | 40.3        | 9.0         |
| CP7909 (P)                                                              | 122.5                      |              |              |  | 63.5        | 156.0        | 4-Jun         | 33.8        | 9.7         |
| Flathead ++                                                             | <b>159.6</b>               | <b>148.3</b> | <b>134.2</b> |  | 63.4        | 161.0        | 9-Jun         | 36.8        | 10.1        |
| FourOsix +                                                              | 143.7                      | 136.4        | 121.7        |  | 62.8        | 167.0        | 15-Jun        | 34.7        | 9.8         |
| Incline AX +                                                            | 150.5                      | 136.5        | 108.6        |  | 61.1        | 167.0        | 15-Jun        | 38.5        | 8.9         |
| Judee +                                                                 | 146.3                      | 140.7        | 125.3        |  | <b>64.0</b> | 167.0        | 15-Jun        | 38.0        | 10.4        |
| Keldin (P)+                                                             | <b>167.6</b>               | <b>151.5</b> | <b>134.8</b> |  | 62.9        | 167.0        | 15-Jun        | 37.4        | 9.8         |
| Langin +                                                                | <b>161.9</b>               |              |              |  | 61.4        | 161.0        | 9-Jun         | 35.9        | 9.2         |
| LCS 18-7071 (P)                                                         | 150.4                      |              |              |  | 61.5        | 167.0        | 15-Jun        | 40.2        | 9.6         |
| LCS Helix AX (P)++                                                      | <b>159.3</b>               |              |              |  | 63.2        | 163.3        | 11-Jun        | 37.7        | 9.7         |
| LCS Jet (P)+                                                            | <b>171.1</b>               | <b>158.4</b> | <b>146.4</b> |  | 61.5        | 167.0        | 15-Jun        | 33.9        | 9.6         |
| LCS Photon AX (P)+                                                      | 123.7                      |              |              |  | <b>64.5</b> | 163.0        | 11-Jun        | 38.5        | 10.7        |
| Loma +                                                                  | <b>162.8</b>               | 146.6        | 126.9        |  | 61.2        | 171.3        | 19-Jun        | 38.8        | 10.5        |
| Long Branch (P)+                                                        | 155.0                      | 138.1        | 125.9        |  | 63.1        | 161.0        | 9-Jun         | 36.5        | 9.7         |
| Mpress (SWW) (P)+                                                       | <b>170.7</b>               |              |              |  | 60.8        | 168.3        | 16-Jun        | 37.0        | 9.5         |
| MT1642                                                                  | <b>166.2</b>               | <b>151.0</b> | <b>132.7</b> |  | 62.3        | 167.0        | 15-Jun        | 40.3        | 10.1        |
| MT1683                                                                  | <b>158.5</b>               | <b>148.6</b> | 132.4        |  | 62.2        | 167.0        | 15-Jun        | 39.3        | 10.1        |
| MT1745                                                                  | <b>166.8</b>               | 145.6        |              |  | 62.5        | 167.0        | 15-Jun        | 41.0        | 10.2        |
| MT1746                                                                  | 146.6                      | 137.5        |              |  | 63.6        | 167.0        | 15-Jun        | 37.7        | 10.4        |
| MT1787                                                                  | 140.8                      | 130.8        |              |  | 62.7        | 167.0        | 15-Jun        | 36.0        | 10.7        |
| MT1793                                                                  | 138.0                      | 129.9        |              |  | 62.0        | 163.0        | 11-Jun        | 36.1        | 10.4        |
| MT1845                                                                  | 145.2                      |              |              |  | 62.3        | 165.0        | 13-Jun        | 37.2        | <b>11.2</b> |
| MT1848                                                                  | <b>159.8</b>               |              |              |  | 62.1        | 167.0        | 15-Jun        | 35.9        | <b>11.1</b> |
| MT1855                                                                  | 153.6                      |              |              |  | 62.5        | 167.7        | 16-Jun        | 39.0        | 10.3        |
| MT1866                                                                  | 155.1                      |              |              |  | 62.6        | 167.0        | 15-Jun        | 36.3        | 9.8         |
| MT1867                                                                  | <b>168.1</b>               |              |              |  | 62.5        | 167.0        | 15-Jun        | 39.0        | 9.7         |
| MT1872                                                                  | 154.8                      |              |              |  | 63.5        | 167.0        | 15-Jun        | 36.9        | 10.1        |
| MTCL1732                                                                | <b>158.7</b>               | 141.0        |              |  | 61.5        | 167.0        | 15-Jun        | 36.6        | 10.5        |
| MTCL1737                                                                | 156.7                      | 144.6        |              |  | 61.2        | 168.3        | 16-Jun        | 35.2        | 10.4        |
| MTS1810                                                                 | 148.6                      |              |              |  | 62.0        | 167.7        | 16-Jun        | 38.7        | <b>11.2</b> |
| MTS18116                                                                | 156.0                      |              |              |  | 60.6        | 169.0        | 17-Jun        | 35.0        | 9.9         |
| MTS18149                                                                | 146.6                      |              |              |  | 58.6        | 170.3        | 18-Jun        | 37.5        | 10.5        |
| MTS1831                                                                 | <b>166.1</b>               |              |              |  | 59.5        | 171.3        | 19-Jun        | 35.6        | 10.2        |
| Northern +                                                              | <b>164.0</b>               | <b>151.6</b> | 127.1        |  | 61.1        | 167.7        | 16-Jun        | 40.8        | 10.2        |
| StandClear CLP (P)+                                                     | 149.3                      | 136.0        | 119.1        |  | 63.7        | 167.0        | 15-Jun        | 36.6        | 10.5        |
| SY 517 CL2 (P)+                                                         | 122.0                      | 107.8        | 89.6         |  | <b>64.8</b> | 161.0        | 9-Jun         | 32.4        | 10.7        |
| SY Clearstone 2CL (P)+                                                  | <b>162.1</b>               | <b>151.2</b> | 130.6        |  | 61.9        | 167.0        | 15-Jun        | 40.5        | 9.7         |
| SY Legend CL2 (P)+                                                      | 141.9                      | 130.5        | 110.7        |  | 63.6        | 161.0        | 9-Jun         | 35.8        | 10.2        |
| SY Monument (P)+                                                        | 145.2                      | 133.1        | 116.8        |  | 61.9        | 167.0        | 15-Jun        | 35.7        | 10.3        |
| SY Wolverine (P)+                                                       | 156.9                      | 134.1        |              |  | 63.6        | 161.0        | 9-Jun         | 35.9        | 10.2        |
| Warhorse +                                                              | 138.5                      | 128.5        | 116.3        |  | 62.1        | 167.0        | 15-Jun        | 39.2        | <b>10.9</b> |
| WB4269 (P)++                                                            | 144.7                      | 128.8        |              |  | 63.6        | 161.0        | 9-Jun         | 35.8        | 10.3        |
| WB4311 (P)+                                                             | 148.9                      | 135.4        |              |  | 62.6        | 167.0        | 15-Jun        | 32.9        | 10.3        |
| WB4418 (P)+                                                             | 145.8                      | 134.0        |              |  | 60.1        | 165.0        | 13-Jun        | 36.2        | 10.2        |
| WB4792 (P)++                                                            | <b>173.5</b>               |              |              |  | 62.2        | 167.0        | 15-Jun        | 37.4        | 9.2         |
| Yellowstone +                                                           | <b>161.6</b>               | 144.8        | 124.4        |  | 61.4        | 167.0        | 15-Jun        | 40.5        | 10.2        |
| Average                                                                 | <b>152.6</b>               | <b>138.8</b> | <b>122.5</b> |  | <b>62.2</b> | <b>165.8</b> | <b>14-Jun</b> | <b>37.2</b> | <b>10.2</b> |
| LSD (0.05)                                                              | <b>15.2</b>                | <b>10.8</b>  | <b>13.7</b>  |  | <b>1.1</b>  | <b>2.2</b>   |               | <b>3.1</b>  | <b>0.6</b>  |
| C.V.                                                                    | <b>6.1</b>                 | <b>3.8</b>   | <b>6.8</b>   |  | <b>1.1</b>  | <b>0.8</b>   |               | <b>5.1</b>  | <b>3.2</b>  |

**bold** = indicates highest value within a column

**bold** = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

(P) = Private Variety; + = Protected Variety; ++ = PVP Pending

**2021 Intrastate Winter Wheat Test (Exp. 35): All Locations (Bozeman, Havre, Sidney, Williston, Kalispell, Moccasin, Huntley, Conrad, NS Ft. Benton)**

| Cultivar/Line    |                          | Pedigree                                 | Plot Numbers |            |            |
|------------------|--------------------------|------------------------------------------|--------------|------------|------------|
| + = new for 2021 |                          |                                          | Rep 1        | Rep 2      | Rep 3      |
|                  | <b>SY 517 CL2</b>        | Syngenta, 2018                           | <b>101</b>   | <b>229</b> | <b>338</b> |
| +                | <b>MTS1908</b>           | (Judee sib, MTS0819)//08X350-A6/Warhorse | <b>102</b>   | <b>206</b> | <b>312</b> |
|                  | <b>SY Wolverine</b>      | Syngenta 2019                            | <b>103</b>   | <b>215</b> | <b>318</b> |
|                  | <b>LCS Helix AX</b>      | Limagrain Cereal Seeds, 2020             | <b>104</b>   | <b>223</b> | <b>302</b> |
|                  | <b>AAC Wildfire</b>      | Alberta/SECAN, 2015                      | <b>105</b>   | <b>208</b> | <b>324</b> |
|                  | <b>Flathead</b>          | Montana, 2019                            | <b>106</b>   | <b>249</b> | <b>330</b> |
| +                | <b>Milestone</b>         | Nutrien, 2020                            | <b>107</b>   | <b>237</b> | <b>347</b> |
| +                | <b>MTS1915</b>           | MTS1596//Emerson/Spur                    | <b>108</b>   | <b>205</b> | <b>334</b> |
|                  | <b>StandClear CLP</b>    | Nutrien, 2020                            | <b>109</b>   | <b>246</b> | <b>344</b> |
|                  | <b>SY Clearstone 2CL</b> | Montana/Syngenta, 2012                   | <b>110</b>   | <b>213</b> | <b>310</b> |
|                  | <b>LCS 18-7071 AX</b>    | Limagrain Cereal Seeds experimental      | <b>111</b>   | <b>236</b> | <b>304</b> |
| +                | <b>MTS1903</b>           | (Judee sib, MTS0819)//08X350-A6/Warhorse | <b>112</b>   | <b>217</b> | <b>341</b> |
|                  | <b>Brawl CL Plus</b>     | Plainsgold/Colorado Wheat Res Fdn, 2011  | <b>113</b>   | <b>224</b> | <b>319</b> |
|                  | <b>Byrd CL Plus</b>      | Plainsgold/Col. Wheat Res Fdn, 2018      | <b>114</b>   | <b>232</b> | <b>328</b> |
|                  | <b>MTCL1737</b>          | YLL-2CL/3/YLL*2/Pelsart//PROM/3*YLL      | <b>115</b>   | <b>226</b> | <b>343</b> |
|                  | <b>MTS18116</b>          | Loma*2/Warhorse                          | <b>116</b>   | <b>245</b> | <b>313</b> |
|                  | <b>FourOsix</b>          | Montana, 2018                            | <b>117</b>   | <b>209</b> | <b>339</b> |
| +                | <b>Battle AX</b>         | Colorado Wheat Fdn/Montech, 2019         | <b>118</b>   | <b>218</b> | <b>306</b> |
|                  | <b>AP 18 AX</b>          | Syngenta experimental line               | <b>119</b>   | <b>240</b> | <b>333</b> |
| +                | <b>MTFH19132</b>         | MT1078//Colter/Emerson                   | <b>120</b>   | <b>203</b> | <b>327</b> |
|                  | <b>Loma</b>              | Montana, 2016                            | <b>121</b>   | <b>234</b> | <b>316</b> |
|                  | <b>Northern</b>          | Montana, 2015                            | <b>122</b>   | <b>222</b> | <b>311</b> |
| +                | <b>MTCL19151</b>         | MT0871/(06X445B1-2, SY Clearstone sib)   | <b>123</b>   | <b>244</b> | <b>342</b> |
| +                | <b>Fortify SF</b>        | Plainsgold/Colorado Wheat Res Fdn, 2019  | <b>124</b>   | <b>212</b> | <b>303</b> |
| +                | <b>MTCL19149</b>         | MTCL1125/MT1091                          | <b>125</b>   | <b>220</b> | <b>332</b> |
|                  | <b>WB4792</b>            | WestBred, 2019                           | <b>126</b>   | <b>242</b> | <b>326</b> |
| +                | <b>CP7869</b>            | Winfield United (Croplan), 2018          | <b>127</b>   | <b>201</b> | <b>315</b> |
| +                | <b>NAS-7653</b>          | Nutrien experimental line                | <b>128</b>   | <b>235</b> | <b>349</b> |
| +                | <b>LCS Julep</b>         | Limagrain Cereal Seeds, 2020             | <b>129</b>   | <b>228</b> | <b>322</b> |
|                  | <b>Yellowstone</b>       | Montana 2005                             | <b>130</b>   | <b>247</b> | <b>321</b> |
|                  | <b>MT1745</b>            | Decade*2/NI06732                         | <b>131</b>   | <b>214</b> | <b>345</b> |
| +                | <b>WB4505</b>            | WestBred, 2019                           | <b>132</b>   | <b>221</b> | <b>314</b> |
| +                | <b>Whistler</b>          | Plainsgold/Colorado Wheat Res Fdn, 2018  | <b>133</b>   | <b>239</b> | <b>340</b> |
|                  | <b>MTS18149</b>          | Loma*2/AAC Gateway                       | <b>134</b>   | <b>204</b> | <b>301</b> |
| +                | <b>CP7017AX</b>          | Winfield United (Croplan), 2020          | <b>135</b>   | <b>233</b> | <b>335</b> |
| +                | <b>WB4401</b>            | WestBred, 2020                           | <b>136</b>   | <b>227</b> | <b>329</b> |
|                  | <b>NP13005004#49</b>     | Syngenta experimental line               | <b>137</b>   | <b>248</b> | <b>323</b> |
|                  | <b>CP7909</b>            | Winfield United (Croplan), 2018          | <b>138</b>   | <b>210</b> | <b>317</b> |
| +                | <b>CP7050AX</b>          | Winfield United (Croplan), 2020          | <b>139</b>   | <b>216</b> | <b>346</b> |
|                  | <b>Judee</b>             | Montana, 2011                            | <b>140</b>   | <b>238</b> | <b>308</b> |
| +                | <b>Balance</b>           | Nutrien, 2020                            | <b>141</b>   | <b>207</b> | <b>336</b> |
| +                | <b>MT19175</b>           | SD08198/Northern                         | <b>142</b>   | <b>230</b> | <b>305</b> |
|                  | <b>MT1872</b>            | MT0859//MT0840/MT0873                    | <b>143</b>   | <b>225</b> | <b>337</b> |
|                  | <b>WB4418</b>            | WestBred, 2018                           | <b>144</b>   | <b>243</b> | <b>307</b> |
|                  | <b>Bobcat</b>            | Montana, 2019                            | <b>145</b>   | <b>211</b> | <b>331</b> |
|                  | <b>Keldin</b>            | WestBred, 2011                           | <b>146</b>   | <b>219</b> | <b>325</b> |

|                 |                                                    |            |            |            |
|-----------------|----------------------------------------------------|------------|------------|------------|
| <b>MTS1855</b>  | 05X438-aC71(MT0097*2//Jagalene/Choteau)/Roughrider | <b>147</b> | <b>241</b> | <b>320</b> |
| <b>MTS1831</b>  | MTS0907/MTS0827                                    | <b>148</b> | <b>202</b> | <b>348</b> |
| <b>Warhorse</b> | Montana, 2013                                      | <b>149</b> | <b>231</b> | <b>309</b> |

| <b>2021 Off-Station Winter Wheat Test (Exp. 38)</b> |                          |                                                    |              |                     |              |
|-----------------------------------------------------|--------------------------|----------------------------------------------------|--------------|---------------------|--------------|
| <b>Cultivar/Line</b>                                |                          | <b>Origin/Pedigree</b>                             |              | <b>Plot Numbers</b> |              |
| <b>¥ = new for 2020</b>                             |                          |                                                    | <b>Rep 1</b> | <b>Rep 2</b>        | <b>Rep 3</b> |
|                                                     | <b>AAC Wildfire</b>      | Alberta: SECAN, 2015                               | <b>101</b>   | <b>201</b>          | <b>310</b>   |
|                                                     | <b>Bobcat</b>            | Montana, 2019                                      | <b>102</b>   | <b>202</b>          | <b>314</b>   |
|                                                     | <b>MT1745</b>            | Decade*2/Ni06732                                   | <b>103</b>   | <b>208</b>          | <b>307</b>   |
|                                                     | <b>Yellowstone</b>       | Montana 2005                                       | <b>104</b>   | <b>221</b>          | <b>306</b>   |
|                                                     | <b>FourOsix</b>          | Montana, 2018                                      | <b>105</b>   | <b>206</b>          | <b>318</b>   |
|                                                     | <b>Judee</b>             | Montana, 2011                                      | <b>106</b>   | <b>209</b>          | <b>315</b>   |
|                                                     | <b>SY Monument</b>       | Syngenta, 2015                                     | <b>107</b>   | <b>217</b>          | <b>308</b>   |
|                                                     | <b>MTS18149</b>          | Loma*2/AAC Gateway                                 | <b>108</b>   | <b>204</b>          | <b>311</b>   |
| ¥                                                   | <b>MTS1831</b>           | MTS0907/MTS0827                                    | <b>109</b>   | <b>214</b>          | <b>325</b>   |
|                                                     | <b>SY Clearstone 2CL</b> | Montana/Syngenta, 2012                             | <b>110</b>   | <b>224</b>          | <b>324</b>   |
|                                                     | <b>Keldin</b>            | Westbred, 2011                                     | <b>111</b>   | <b>205</b>          | <b>322</b>   |
|                                                     | <b>Byrd CL Plus</b>      | Plainsgold/Col. Wheat Res Fdn, 2018 (CO13003C)     | <b>112</b>   | <b>219</b>          | <b>303</b>   |
| ¥                                                   | <b>MTS18116</b>          | Loma*2/Warhorse                                    | <b>113</b>   | <b>218</b>          | <b>320</b>   |
|                                                     | <b>Loma</b>              | Montana, 2016                                      | <b>114</b>   | <b>210</b>          | <b>323</b>   |
|                                                     | <b>Brawl CL Plus</b>     | Colorado Research Foundation, 2011                 | <b>115</b>   | <b>222</b>          | <b>302</b>   |
|                                                     | <b>MTCL1737</b>          | YLL-2CL/3/YLL*2/Pelsart//PROM/3*YLL                | <b>116</b>   | <b>223</b>          | <b>305</b>   |
|                                                     | <b>Flathead</b>          | Montana, 2019                                      | <b>117</b>   | <b>203</b>          | <b>301</b>   |
| ¥                                                   | <b>MT1872</b>            | MT0859/MT0840/MT0873                               | <b>118</b>   | <b>212</b>          | <b>319</b>   |
| ¥                                                   | <b>MTCS20156</b>         | Bobcat//(Bobcat sib, MTS1589)/StandClear CLP       | <b>119</b>   | <b>213</b>          | <b>317</b>   |
|                                                     | <b>LCS Jet</b>           | Limagrains Cereal Seeds, 2015                      | <b>120</b>   | <b>216</b>          | <b>313</b>   |
|                                                     | <b>Northern</b>          | Montana, 2015                                      | <b>121</b>   | <b>211</b>          | <b>316</b>   |
|                                                     | <b>StandClear CLP</b>    | Montana/Nutrien                                    | <b>122</b>   | <b>220</b>          | <b>312</b>   |
|                                                     | <b>Warhorse</b>          | Montana, 2013                                      | <b>123</b>   | <b>207</b>          | <b>309</b>   |
|                                                     | <b>Ray</b>               | Montana, 2018                                      | <b>124</b>   | <b>225</b>          | <b>304</b>   |
| ¥                                                   | <b>MTS1855</b>           | 05X438-aC71(MT0097*2//Jagalene/Choteau)/Roughrider | <b>125</b>   | <b>215</b>          | <b>321</b>   |



**2021 Winter Wheat Management Information**

|                                                                      |                                                                                   |
|----------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Seeding date: 9/28/2020                                              | Field: Y6                                                                         |
| Julian date: 271                                                     | Soil type: Swims silty clay loam                                                  |
| Seeding rate: 28.7 plants/ft <sup>2</sup>                            | Tillage: Conventional                                                             |
| Previous crop: Canola                                                | Soil residual nutrient (N, P, K lb/A): 64.5-10-226                                |
| Herbicide: Axial Bold 15 fl oz/A +<br>Cleasweep M 16 fl oz/A<br>POST | Nutrient fertilizer applied (N, P, K lb/A): Fall: 94-20-35-10S<br>Spring: 150-0-0 |

## 2021 Spring Wheat Herbicide Program

### Introduction:

This study is focused on herbicide combinations to control kochia and wild oat in spring wheat. Herbicide treatments contain herbicides with multiple MOA's as well as herbicide combinations for PRE followed by POST application and soil active herbicides.

| Table 1. Management information |                           |                                                                                          |                       |
|---------------------------------|---------------------------|------------------------------------------------------------------------------------------|-----------------------|
| Seeding date:                   | 4/27/2021                 | Field:                                                                                   | P2                    |
| Julian date:                    | 117                       | Soil type:                                                                               | Swims silty clay loam |
| Seeding rate:                   | 24 plants/ft <sup>2</sup> | Tillage:                                                                                 | Conventional          |
| Previous crop:                  | Barley                    | Soil residual nutrient (NO <sub>3</sub> <sup>-</sup> , P, K lb/A):                       | 122.5-20-376          |
|                                 |                           | Nutrient fertilizer applied ( N, P <sub>2</sub> O <sub>5</sub> , K <sub>2</sub> O lb/A): | 110-30-25-10S         |



**Table 2. Treatments**

| Trt No.                                                                               | Treatment Name   | Form          |           | Rate | Rate Unit  | Appl Timing |
|---------------------------------------------------------------------------------------|------------------|---------------|-----------|------|------------|-------------|
|                                                                                       |                  | Concentration | Form Unit |      |            |             |
| 1                                                                                     | Non-treated      |               |           |      |            |             |
| 2                                                                                     | Sharpen fb       | 2.85          | LBA/GAL   | 4    | fl oz/a    | PRE PLANT   |
|                                                                                       | Axial Star       | 1.15          | LBA/GAL   | 16.4 | fl oz/a    | POST        |
| 3                                                                                     | Zidua            | 4.17          | LB/GAL    | 2.5  | fl oz/a    | PRE         |
| 4                                                                                     | Zidua fb         | 4.17          | LB/GAL    | 2.5  | fl oz/a    | PRE         |
|                                                                                       | Axial Star       | 1.15          | LBA/GAL   | 16.4 | fl oz/a    | POST        |
| 5                                                                                     | Anthem Flex fb   | 4             | LBA/GAL   | 2.75 | fl oz/a    | PRE         |
|                                                                                       | Axial Star       | 1.15          | LBA/GAL   | 16.4 | fl oz/a    | POST        |
| 6                                                                                     | Prowl fb         | 3.8           | LBA/GAL   | 1.5  | pt/a       | Early POST  |
|                                                                                       | Axial Star       | 1.15          | LBA/GAL   | 16.4 | fl oz/a    | POST        |
| 7                                                                                     | Axial Star       | 1.15          | LBA/GAL   | 16.4 | fl oz/a    | POST        |
| 8                                                                                     | Axial Star +     | 1.15          | LBA/GAL   | 16.4 | fl oz/a    | POST        |
|                                                                                       | Affinity TankMix | 50            | % wt      | 1    | oz/a       |             |
| 9                                                                                     | Axial XL +       | 0.42          | LB/GAL    | 16.4 | fl oz/a    | POST        |
|                                                                                       | Talinor          | 1.77          | LBA/GAL   | 13.7 | fl oz/a    |             |
| 10                                                                                    | Huskie +         | 2.06          | LB/GAL    | 11   | fl oz/a    | POST        |
|                                                                                       | Axial XL         | 0.42          | LB/GAL    | 16.4 | fl oz/a    |             |
| 11                                                                                    | Opensky          | 1.057         | LBA/GAL   | 1    | pt/a       | POST        |
| 12                                                                                    | Opensky +        | 1.057         | LBA/GAL   | 1    | pt/a       | POST        |
|                                                                                       | 2,4-Dester LV6   | 5.6           | LBA/GAL   | 7    | fl oz/a    |             |
| 13                                                                                    | Varro +          | 0.083         | LBA/GAL   | 6.85 | fl oz/a    | POST        |
|                                                                                       | Fluroxypyr       | 2.8           | LBA/GAL   | 0.3  | pt/a       |             |
| 14                                                                                    | WideMatch +      | 1.5           | LB/GAL    | 1    | pt/a       | POST        |
|                                                                                       | Affinity TankMix | 50            | % wt      | 1    | oz/a       |             |
| * Included in each POST application                                                   |                  |               |           |      |            |             |
| ADJ                                                                                   | AMS              |               |           | 17   | lb/100 gal |             |
| ADJ                                                                                   | NIS              |               |           | 0.25 | % v/v      |             |
| PRE applications were made after germination when the hypocotyl was 1 inch in length. |                  |               |           |      |            |             |
| Early POST application was made to spiking wheat                                      |                  |               |           |      |            |             |
| POST treatments were applied at 2 <sup>nd</sup> node                                  |                  |               |           |      |            |             |

**Table 3. Weed Control and Crop Injury**

| Trt No. | Treatment Name   | Rate | Rate Unit | % Control* |    | % Control |   | % Crop Injury |   |
|---------|------------------|------|-----------|------------|----|-----------|---|---------------|---|
|         |                  |      |           | Wild oat   |    | Kochia    |   | Spring wheat  |   |
| 1       | Non-treated      |      |           | 0          |    | 0         |   | 0             |   |
| 2       | Sharpen fb*      | 4    | fl oz/a   | 97         | a* | 99        | a | 0             | b |
|         | Axial Star       | 16.4 | fl oz/a   |            |    |           |   |               |   |
| 3       | Zidua            | 2.5  | fl oz/a   | 35         | b  | 99        | a | 0             | b |
| 4       | Zidua fb         | 2.5  | fl oz/a   | 93         | a  | 99        | a | 3             | b |
|         | Axial Star       | 16.4 | fl oz/a   |            |    |           |   |               |   |
| 5       | Anthem Flex fb   | 2.75 | fl oz/a   | 96         | a  | 99        | a | 0             | b |
|         | Axial Star       | 16.4 | fl oz/a   |            |    |           |   |               |   |
| 6       | Prowl fb         | 1.5  | pt/a      | 96         | a  | 99        | a | 3             | b |
|         | Axial Star       | 16.4 | fl oz/a   |            |    |           |   |               |   |
| 7       | Axial Star       | 16.4 | fl oz/a   | 94         | a  | 99        | a | 1             | b |
| 8       | Axial Star +     | 16.4 | fl oz/a   | 92         | a  | 99        | a | 3             | b |
|         | Affinity TankMix | 1    | oz/a      |            |    |           |   |               |   |
| 9       | Axial XL +       | 16.4 | fl oz/a   | 88         | a  | 99        | a | 16            | a |
|         | Talinor          | 13.7 | fl oz/a   |            |    |           |   |               |   |
| 10      | Huskie +         | 11   | fl oz/a   | 87         | a  | 99        | a | 1             | b |
|         | Axial XL         | 16.4 | fl oz/a   |            |    |           |   |               |   |
| 11      | Opensky          | 1    | pt/a      | 75         | a  | 99        | a | 5             | b |
| 12      | Opensky +        | 1    | pt/a      | 87         | a  | 99        | a | 3             | b |
|         | 2,4-Dester LV6   | 7    | fl oz/a   |            |    |           |   |               |   |
| 13      | Varro +          | 6.85 | fl oz/a   | 88         | a  | 99        | a | 6             | b |
|         | Fluroxypyr       | 0.3  | pt/a      |            |    |           |   |               |   |
| 14      | WideMatch +      | 1    | pt/a      | 75         | a  | 99        | a | 4             | b |
|         | Affinity TankMix | 1    | oz/a      |            |    |           |   |               |   |

\*Weed control and crop injury were assessed two weeks after the last herbicide application was made; fb – followed by, indicating later herbicide application; treatments with the same letter grouping are not significantly different,  $\alpha=0.05$

## Cool-Season Perennial Grass Forages

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**Table 1.** Management information

|                |                   |                                                             |                                                           |
|----------------|-------------------|-------------------------------------------------------------|-----------------------------------------------------------|
| Seeding date:  | 4/22/2020         | Field Location:                                             | P2                                                        |
| Julian date:   | 113               | Harvest date:                                               | 7/17-10/15, depending on varieties; some had two cuttings |
| Seeding rate:  | Variety-dependent |                                                             |                                                           |
| Previous crop: | Winter wheat      | Soil type:                                                  | Creston Silt Loam                                         |
| Herbicide:     | 7/10: Shredder    | Tillage:                                                    | Conventional                                              |
| Insecticide:   | None              | Soil residual nutrient                                      |                                                           |
|                |                   | (NO <sub>3</sub> <sup>-</sup> , P, K lb/A):                 | 122-20-376                                                |
| Fungicide:     | None              | Nutrient fertilizer applied                                 |                                                           |
|                |                   | (N, P <sub>2</sub> O <sub>5</sub> , K <sub>2</sub> O lb/A): | 4/8: 84-10-35-10(S)                                       |

**Table 2.** 2020 Forage yields of cool-season and warm-season

| Variety                       | No. of cuttings | Forage yield (tons/A) |
|-------------------------------|-----------------|-----------------------|
| <b>Cool season</b>            |                 |                       |
| Orchardgrass                  | 2               | 2.8                   |
| Smooth brome                  | 1               | 2.7                   |
| Creeping wheatgrass           | 1               | 2.4                   |
| Meadow brome                  | 2               | 2.4                   |
| Meadow fescue_2               | 2               | 2.4                   |
| Dryland mix_2                 | 2               | 2.4                   |
| Tall fescue/meadow fescue mix | 2               | 2.3                   |
| Meadow fescue_1               | 2               | 2.3                   |
| Dryland orchardgrass          | 2               | 2.2                   |
| Dryland mix_1                 | 2               | 2.2                   |
| Perennial ryegrass_2          | 1               | 2.1                   |
| Perennial ryegrass_1          | 1               | 1.9                   |
| Tall fescue                   | 2               | 1.9                   |
| Dryland tall fescue           | 2               | 1.7                   |
| <b>Warm season</b>            |                 |                       |
| Teff                          | 2               | 3.3                   |
| Crabgrass                     | 1               | 1.9                   |
| <b>Overall Mean:</b>          |                 | 2.3                   |
| <b>CV (%):</b>                |                 | 23.9                  |
| <b>LSD</b>                    |                 | 0.9                   |
| <b>Pr &gt; F</b>              |                 | <0.01                 |

Table 3. Forage quality

| Entries                       | Water Soluble Carbohydrates |       | Lignin |       | Crude Protein |       | Relative Feed Quality |       |
|-------------------------------|-----------------------------|-------|--------|-------|---------------|-------|-----------------------|-------|
|                               | Cut 1                       | Cut 2 | Cut 1  | Cut 2 | Cut 1         | Cut 2 | Cut 1                 | Cut 2 |
| <b>Cool season</b>            |                             |       |        |       |               |       |                       |       |
| Dryland mix_1                 | 12.6                        | 14.8  | 2.1    | 3.6   | 13.6          | 10.3  | 161.3                 | 148.0 |
| Dryland mix_2                 | 12.0                        | 15.3  | 2.2    | 3.6   | 14.3          | 10.2  | 156.3                 | 149.7 |
| Dryland orchardgrass          | 12.3                        | 18.7  | 2.1    | 3.8   | 9.9           | 10.3  | 139.3                 | 159.0 |
| Dryland tall fescue           | 15.3                        | 19.1  | 1.9    | 3.6   | 12.9          | 10.0  | 171.3                 | 153.3 |
| Meadow brome                  | 11.8                        | 14.1  | 2.3    | 3.9   | 12.3          | 7.9   | 151.7                 | 138.0 |
| Meadow fescue_1               | 16.2                        | 20.1  | 1.1    | 2.4   | 11.3          | 13.5  | 180.7                 | 192.0 |
| Meadow fescue_2               | 15.0                        | 20.4  | 1.0    | 2.7   | 10.6          | 10.2  | 173.0                 | 172.0 |
| Orchardgrass                  | 13.9                        | 20.3  | 1.9    | 3.8   | 9.2           | 8.4   | 145.0                 | 150.0 |
| Tall fescue                   | 14.7                        | 17.5  | 1.4    | 2.4   | 12.9          | 13.0  | 173.0                 | 174.0 |
| Tall fescue/meadow fescue mix | 16.2                        | 19.2  | 1.4    | 2.6   | 11.4          | 14.7  | 176.0                 | 191.0 |
| Creeping wheatgrass           | 15.0                        | -     | 3.2    | -     | 9.1           | -     | 137.0                 | -     |
| Perennial ryegrass_1          | 18.0                        | -     | 1.2    | -     | 10.6          | -     | 178.7                 | -     |
| Perennial ryegrass_2          | 15.8                        | -     | 1.6    | -     | 8.4           | -     | 154.0                 | -     |
| Smooth brome                  | 13.1                        | -     | 2.6    | -     | 8.7           | -     | 137.0                 | -     |
| <b>Warm season</b>            |                             |       |        |       |               |       |                       |       |
| Teffgrass                     | 10.2                        | 9.4   | 3.0    | 3.9   | 13.8          | 9.4   | 145.3                 | 124.7 |
| Crabgrass                     | 12.2                        | -     | 3.0    | -     | 11.7          | -     | 143.0                 | -     |
| <b>Mean</b>                   | 14                          | 15.9  | 2.5    | 3.5   | 10.9          | 10.2  | 157.7                 | 151.4 |
| <b>Mean (cuts)</b>            | 14.9                        |       | 3      |       | 10.5          |       | 154.5                 |       |
| <b>CV (%)</b>                 | 8.5                         | 4.2   | 29.7   | 8.2   | 17.3          | 11.3  | 4.5                   | 5.3   |
| <b>LSD</b>                    | 1.9                         | 1.2   | 1.2    | 0.5   | 3.1           | 2.1   | 11.8                  | 14.6  |
| <b>Pr &gt; F</b>              | <.001                       | <.001 | <.001  | <.001 | <.001         | <.005 | <.001                 | <.001 |

Table 4. 2021 Yield (1<sup>st</sup> Cut)

| Variety                       | Cut1 Yield (t/A) |     |
|-------------------------------|------------------|-----|
| Tall fescue                   | 5.4              | a   |
| Meadow brome                  | 4.8              | ab  |
| Smooth brome                  | 4.6              | ab  |
| Creeping wheatgrass           | 4.6              | ab  |
| Dryland mix_2                 | 4.4              | ab  |
| Dryland mix_1                 | 4.2              | bc  |
| Meadow fescue_1               | 4.0              | bcd |
| Perennial ryegrass_1          | 3.9              | bcd |
| Perennial ryegrass_2          | 3.9              | bcd |
| Orchardgrass                  | 3.8              | bcd |
| Dryland orchardgrass          | 3.8              | bcd |
| Meadow fescue_2               | 3.3              | cde |
| Dryland tall fescue           | 3.1              | de  |
| Tall fescue/meadow fescue mix | 2.7              | e   |
| <b>MEAN</b>                   | <b>4.0</b>       |     |
| <b>CV</b>                     | <b>14.9</b>      |     |
| <b>LSD</b>                    | <b>1.0</b>       |     |

Table 5. Entry list

| Trt. | Entry                     | Species                       | Seeding Rate<br>lbs/acre | Rep 1 | Rep 2 | Rep 3 |
|------|---------------------------|-------------------------------|--------------------------|-------|-------|-------|
| 1    | Mojo w/Yellow Jacket      | Crabgrass                     | 8                        | 101   | 202   | 301   |
| 2    | Moxie w/ Yellow Jacket    | Teffgrass                     | 10                       | 102   | 201   | 302   |
| 3    | Arsenal                   | Meadow brome                  | 25                       | 103   | 207   | 310   |
| 4    | Artillery                 | Smooth brome                  | 20                       | 104   | 213   | 308   |
| 5    | Hamann                    | Creeping wheatgrass           | 15                       | 105   | 212   | 303   |
| 6    | Barricade raw             | Dryland mix                   | 20                       | 106   | 214   | 316   |
| 7    | Barricade w/Yellow Jacket | Dryland mix                   | 30                       | 107   | 211   | 313   |
| 8    | Ammo                      | Dryland orchardgrass          | 15                       | 108   | 215   | 311   |
| 9    | HLR                       | Orchardgrass                  | 15                       | 109   | 204   | 306   |
| 10   | Armory                    | Dryland tall fescue           | 15                       | 110   | 208   | 315   |
| 11   | STF-43                    | Tall fescue                   | 15                       | 111   | 203   | 305   |
| 12   | Milkway                   | Tall fescue/meadow fescue mix | 15                       | 112   | 205   | 314   |
| 13   | Driftless                 | Meadow fescue                 | 15                       | 113   | 209   | 312   |
| 14   | HDR                       | Meadow fescue                 | 15                       | 114   | 216   | 309   |
| 15   | Remington                 | Perennial ryegrass            | 30                       | 115   | 206   | 307   |
| 16   | Remington NEA2            | Perennial ryegrass            | 30                       | 116   | 210   | 304   |